

OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **LONG POND, NORTHWOOD** the program coordinators recommend the following actions. *We recommend sampling more frequently during the summer months to provide us with more data. This will allow us to track any changes occurring in the pond or its watershed that could negatively affect the water quality.*

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a, also a measure of algal abundance, in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. There was no chlorophyll-a data for this season due to laboratory error. Chlorophyll concentrations in the lake have been relatively stable, and we hope to see this trend continue next season. It is important to realize that chlorophyll readings can change daily and one sample per summer cannot accurately portray seasonal trends. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.
- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows an *improving* trend in lake transparency. Water clarity increased this season and was the highest ever recorded for the lake! This reading was the same as the state mean. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.
- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is

the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show an *improving* trend for the upper water layer, and a *stabilizing* trend for the lower water layer. The epilimnetic phosphorus concentration was slightly higher than last season's. The high value for the hypolimnion seems to be due to the combination of the depletion of dissolved oxygen and the turbidity of the sample. When dissolved oxygen falls below 1 mg/L, phosphorus normally bound to the sediment is released into the water column. Also contamination of the sample with bottom sediment has been a common cause of increased phosphorus concentrations. Sampling more than once per summer will help us to accurately track the phosphorus trend in the pond. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- There was no chlorophyll-a data for the 2000 season. The plankton sample revealed that golden-brown algae were dominant in the lake in August. These algae are not nuisance species, but when overly abundant they tend to give a fishy odor to the water. Continued care to protect the watershed by limiting or eliminating fertilizer use on lawns, keeping the lake shoreline natural, and properly maintaining septic systems and roads will keep algae populations in balance.
- Conductivity remains low at all stations of the lake. Conductivity decreased slightly in most stations this year (Table 6), however with only one sample collected this summer we cannot offer a more detailed analysis. Conductivity increases often indicate the influence of human activities on surface waters. Septic system leachate, agricultural runoff, iron deposits, and road runoff can all influence conductivity. The low conductivity values in the Long Pond watershed are promising for the health of the pond.
- Phosphorus concentrations increased slightly this season at all stations of the lake (Table 8), but remained in the low to average range for NH lakes (See Chemical Monitoring Parameters). The hypolimnetic phosphorus concentration was high and may be explained by two possible scenarios: dissolved oxygen was depleted in the last five meters resulting in internal phosphorus loading, and the sample was excessively turbid (Figure Interpretation 3). Some sources of phosphorus to a lake include septic systems, fertilizers, erosion, destruction of vegetative buffering zones, and sandy beaches.

NOTES

- Monitor's Note (8/6/00): Beautiful day. Last week lots of rain.
- Biologist's Note (8/6/00): Chlorophyll-a not run because of error in lab.

USEFUL RESOURCES

Lake Smarts: The First Lake Maintenance Handbook, A Do-It-Yourself Guide to Solving Lake Problems. The Terrene Institute. (800) 726-5253, or www.terrene.org

Effects of Phosphorus on New Hampshire's Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Vegetated Shoreline Buffers, video, North Country RC&D, (603) 527-2093

The Blue Green Algae. North American Lake Management Society, 1989. (608) 233-2836 or www.nalms.org

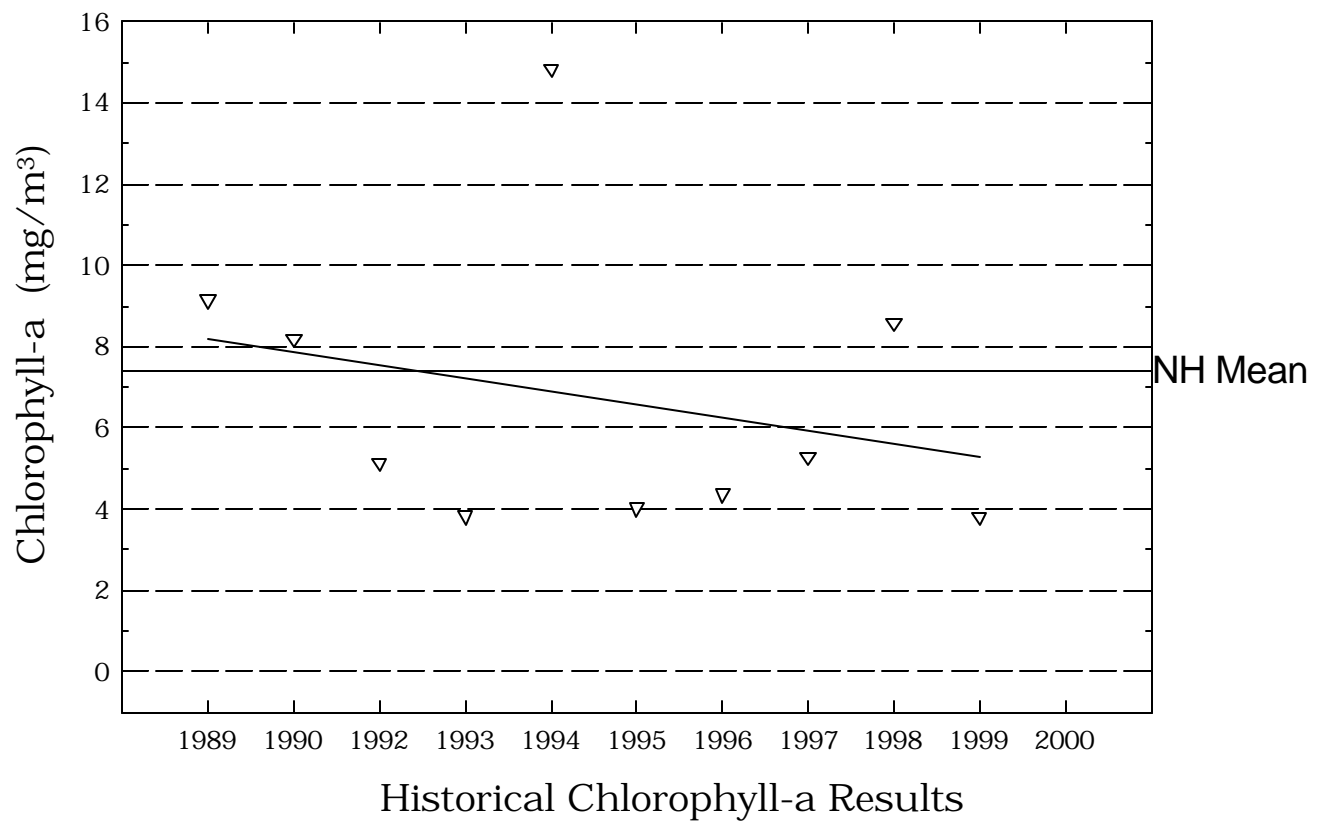
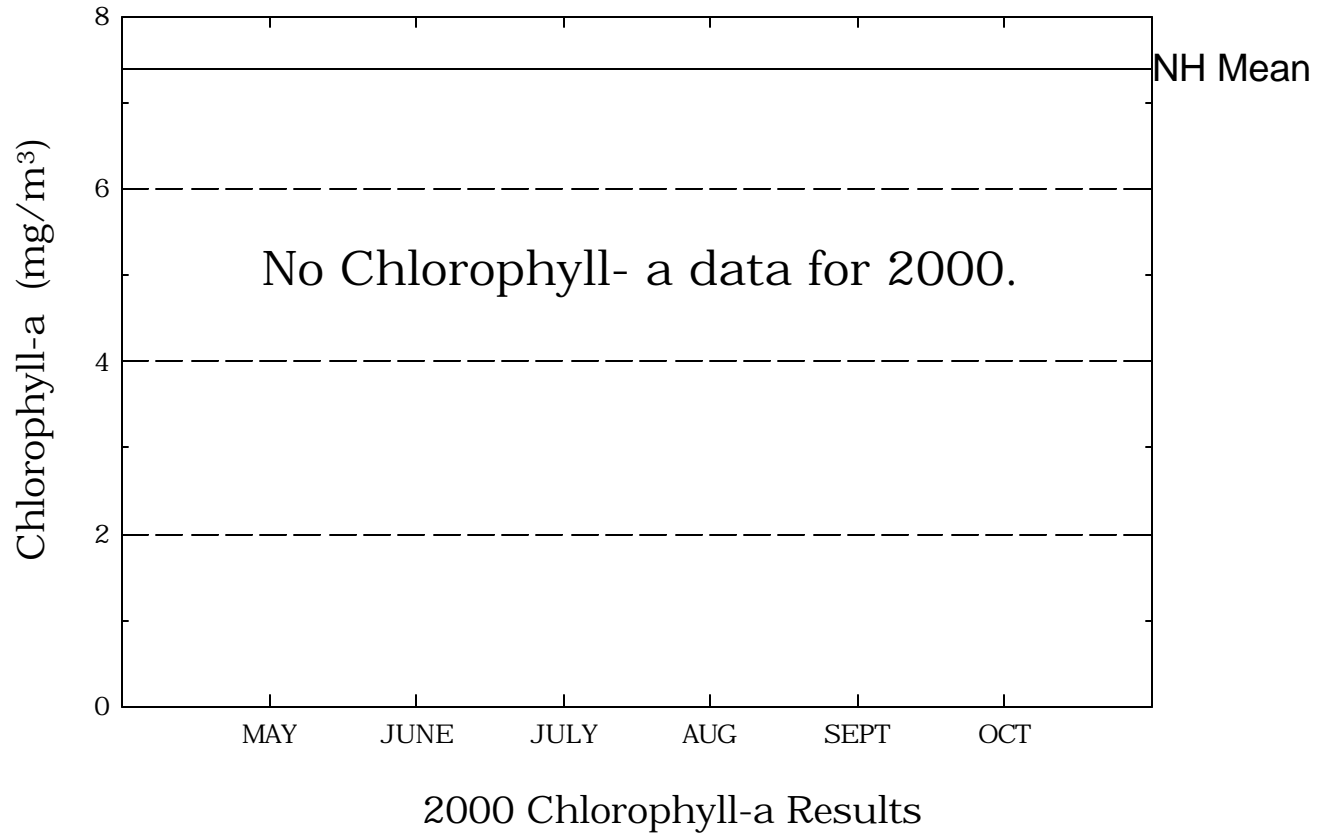
Safe Boating, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

The Lake Pocket Book, The Terrene Institute, 2000. (800) 726-5253, or www.terrene.org

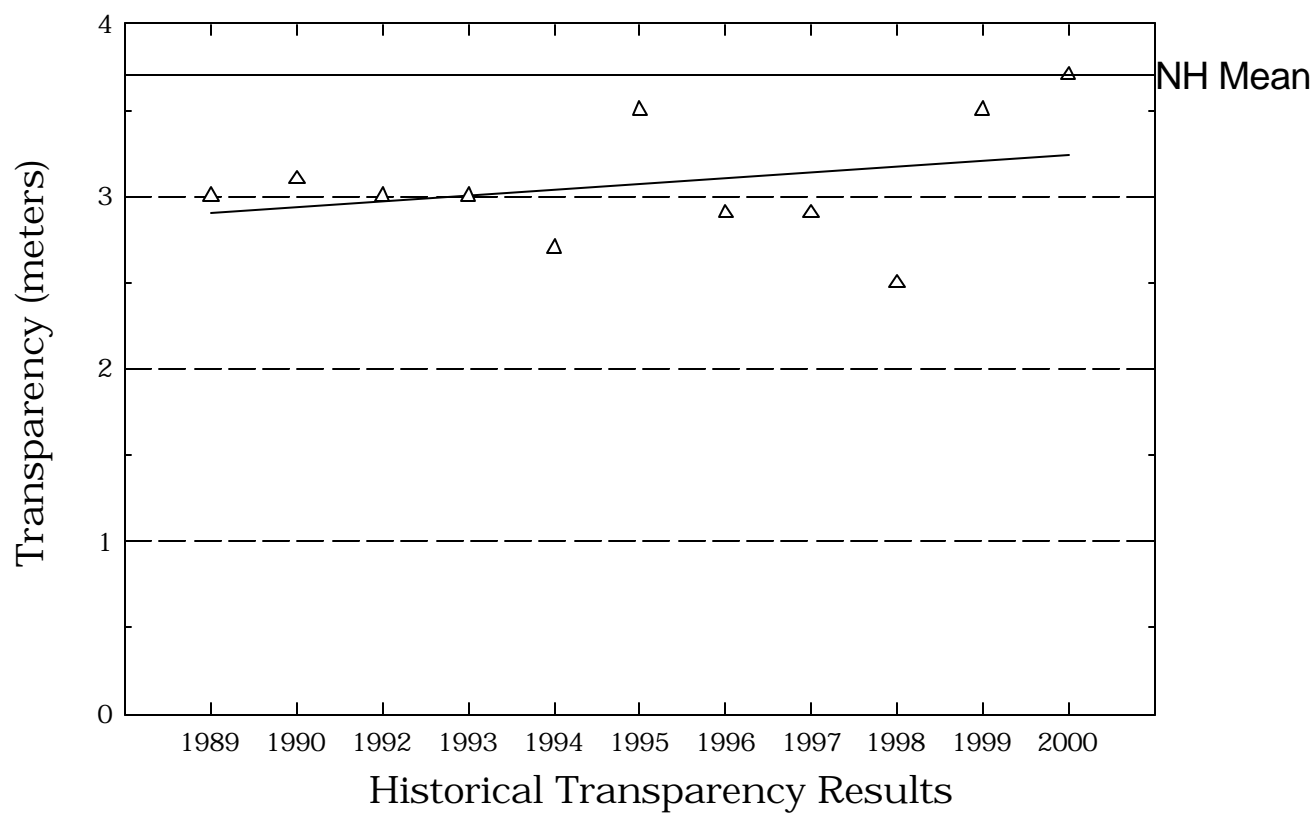
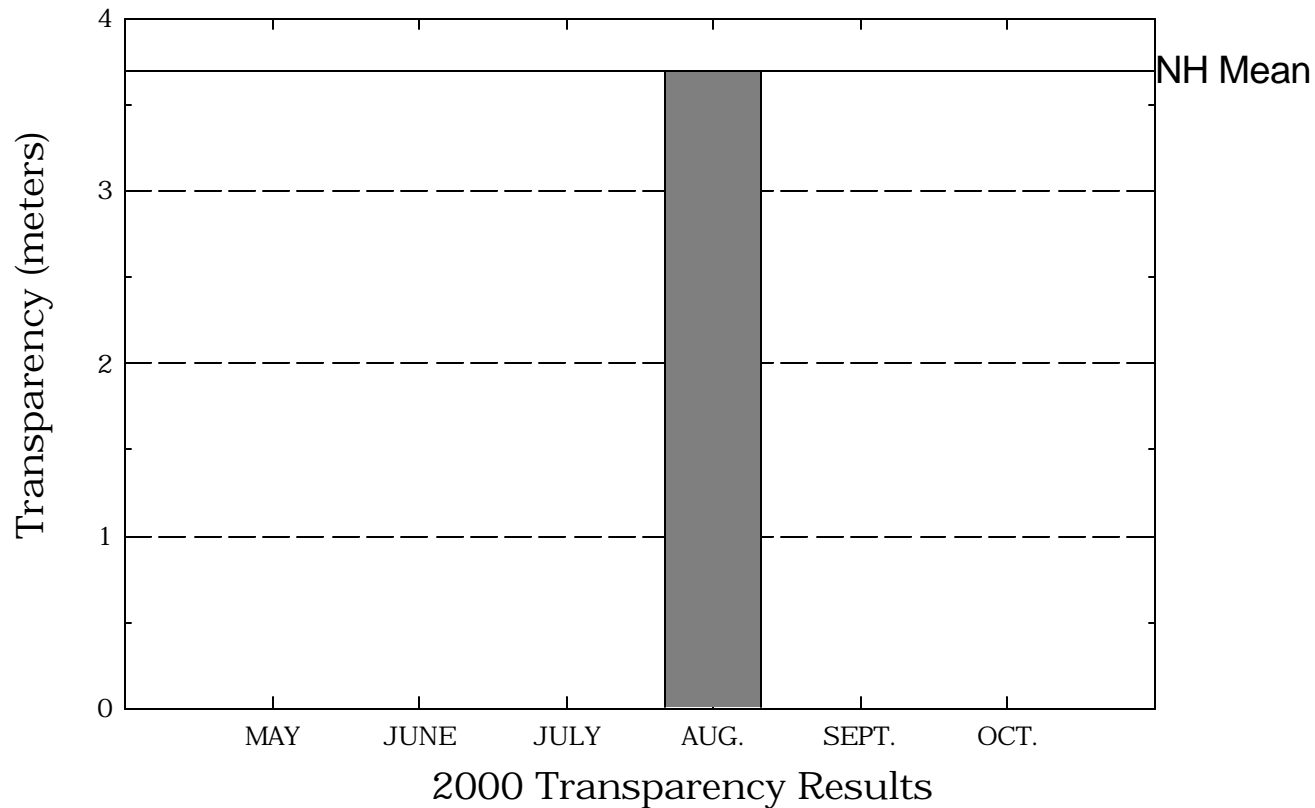
Long Pond, Northwood

Figure 1. Monthly and Historical Chlorophyll-a Results



Long Pond, Northwood

Figure 2. Monthly and Historical Transparency Results



Long Pond, Northwood

Figure 3. Monthly and Historical Total Phosphorus Data.

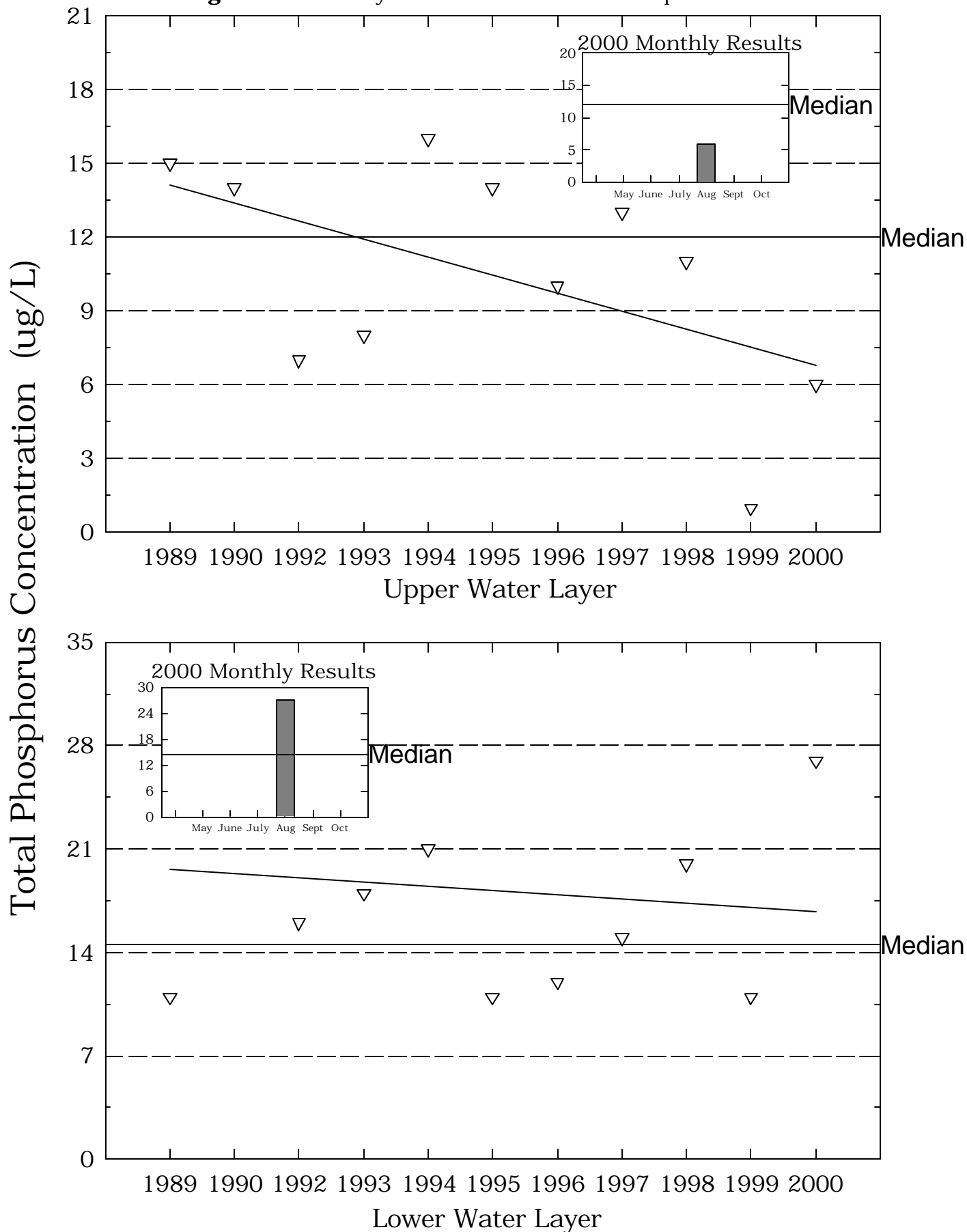


Table 1.**LONG POND
NORTHWOOD****Chlorophyll-a results (mg/m³) for current year and historical
sampling periods.**

Year	Minimum	Maximum	Mean
1989	9.16	9.16	9.16
1990	8.18	8.18	8.18
1992	5.14	5.14	5.14
1993	3.84	3.84	3.84
1994	14.84	14.84	14.84
1995	4.03	4.03	4.03
1996	4.38	4.38	4.38
1997	5.29	5.29	5.29
1998	8.59	8.59	8.59
1999	3.82	3.82	3.82

Table 2.

**LONG POND
NORTHWOOD**

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
08/24/1989	PERIDINIUM	45
	DINOBYRON	18
	CHRYSOSPHAERELLA	
09/08/1990	DINOBYRON	35
	CHRYSOSPHAERELLA	26
	PERIDINIUM	26
07/26/1992	CHRYSOSPHAERELLA	51
	PERIDINIUM	25
07/25/1993	DINOBYRON	84
07/31/1994	CHRYSOSPHAERELLA	95
07/30/1995	CHRYSOSPHAERELLA	72
	DINOBYRON	18
	RHIZOLENIA	2
08/06/1996	MALLOMONAS	47
	SYNURA	36
	CHRYSOSPHAERELLA	11
08/23/1998	MALLOMONAS	85
	PERIDINIUM	5
	ELAKATOTHRIX	3
08/10/1999	CHRYSOSPHAERELLA	87
	DINOBYRON	7
	PERIDINIUM	5
08/06/2000	SYNURA	89
	MALLOMONAS	4
	CHRYSOSPHAERELLA	3

Table 3.**LONG POND
NORTHWOOD****Summary of current and historical Secchi Disk
transparency results (in meters).**

Year	Minimum	Maximum	Mean
1989	3.0	3.0	3.0
1990	3.1	3.1	3.1
1992	3.0	3.0	3.0
1993	3.0	3.0	3.0
1994	2.7	2.7	2.7
1995	3.5	3.5	3.5
1996	2.9	2.9	2.9
1997	2.9	2.9	2.9
1998	2.5	2.5	2.5
1999	3.5	3.5	3.5
2000	3.7	3.7	3.7

Table 4.**LONG POND
NORTHWOOD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
BEAVER BROOK OUTLET	1990	6.40	6.40	6.40
	1992	6.58	6.58	6.58
	1993	6.38	6.38	6.38
	1994	5.91	5.91	5.91
	1995	6.55	6.55	6.55
	1996	5.86	5.86	5.86
	1997	6.12	6.12	6.12
	1998	6.00	6.00	6.00
	1999	6.26	6.26	6.26
	2000	6.27	6.27	6.27
BUG BROOK OUTLET	1990	6.32	6.32	6.32
	1992	6.43	6.43	6.43
	1993	6.24	6.24	6.24
	1994	6.32	6.32	6.32
	1995	6.18	6.18	6.18
	1996	5.51	5.51	5.51
	1997	5.39	5.39	5.39
	1998	5.99	5.99	5.99
	1999	6.31	6.31	6.31
	2000	6.01	6.01	6.01
EPILIMNION	1990	6.28	6.28	6.28
	1992	6.66	6.66	6.66
	1993	6.71	6.71	6.71
	1994	6.64	6.64	6.64

Table 4.

**LONG POND
NORTHWOOD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
	1995	6.58	6.58	6.58
	1996	5.90	5.90	5.90
	1997	6.32	6.32	6.32
	1998	6.10	6.10	6.10
	1999	6.66	6.66	6.66
	2000	6.32	6.32	6.32
HYPOLIMNION				
	1990	6.10	6.10	6.10
	1992	5.87	5.87	5.87
	1993	6.15	6.15	6.15
	1994	5.82	5.82	5.82
	1995	5.79	5.79	5.79
	1996	5.62	5.62	5.62
	1997	5.58	5.58	5.58
	1998	5.94	5.94	5.94
	1999	5.82	5.82	5.82
	2000	6.10	6.10	6.10
INLET BROOK				
	1990	6.19	6.19	6.19
	1992	6.35	6.35	6.35
	1993	6.12	6.12	6.12
	1994	6.11	6.11	6.11
	1995	6.11	6.11	6.11
	1996	5.72	5.72	5.72
	1998	5.35	5.35	5.35
	1999	6.06	6.06	6.06
	2000	5.82	5.82	5.82

Table 4.

**LONG POND
NORTHWOOD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
ISLAND POND BK				
	1996	5.41	5.41	5.41
METALIMNION				
	1990	6.35	6.35	6.35
	1992	6.62	6.62	6.62
	1993	6.62	6.62	6.62
	1994	6.07	6.07	6.07
	1995	6.08	6.08	6.08
	1996	5.68	5.68	5.68
	1997	5.71	5.71	5.71
	1998	5.90	5.90	5.90
	1999	6.30	6.30	6.30
	2000	6.27	6.27	6.27
NORTHWEST INLET B				
	1990	6.28	6.28	6.28
	1992	6.21	6.21	6.21
NORTHWEST INLET				
	1990	6.40	6.40	6.40
WEED BROOK				
	1990	5.30	5.30	5.30
	1993	5.79	5.79	5.79
	1994	5.83	5.83	5.83
	1995	5.94	5.94	5.94
	1996	5.10	5.10	5.10
	1999	5.96	5.96	5.96

Table 4.

**LONG POND
NORTHWOOD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
	2000	5.50	5.50	5.50

Table 5.

**LONG POND
NORTHWOOD**

**Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO₃.**

Epilimnetic Values

Year	Minimum	Maximum	Mean
1990	2.00	2.00	2.00
1992	2.70	2.70	2.70
1993	3.10	3.10	3.10
1994	2.70	2.70	2.70
1995	3.40	3.40	3.40
1996	2.40	2.40	2.40
1997	2.00	2.00	2.00
1998	2.20	2.20	2.20
2000	2.40	2.40	2.40

Table 6.

**LONG POND
NORTHWOOD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
BEAVER BROOK OUTLET	1990	23.6	23.6	23.6
	1992	24.3	24.3	24.3
	1993	26.0	26.0	26.0
	1994	27.3	27.3	27.3
	1995	27.8	27.8	27.8
	1996	28.4	28.4	28.4
	1997	25.8	25.8	25.8
	1998	24.5	24.5	24.5
	1999	28.8	28.8	28.8
	2000	27.6	27.6	27.6
BUG BROOK OUTLET	1990	23.6	23.6	23.6
	1992	25.9	25.9	25.9
	1993	25.5	25.5	25.5
	1994	27.2	27.2	27.2
	1995	26.6	26.6	26.6
	1996	27.9	27.9	27.9
	1997	26.4	26.4	26.4
	1998	24.3	24.3	24.3
	1999	28.4	28.4	28.4
	2000	26.9	26.9	26.9
EPILIMNION	1990	25.1	25.1	25.1
	1992	23.2	23.2	23.2
	1993	25.8	25.8	25.8
	1994	26.9	26.9	26.9

Table 6.

**LONG POND
NORTHWOOD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
	1995	27.7	27.7	27.7
	1996	28.3	28.3	28.3
	1997	25.2	25.2	25.2
	1998	24.3	24.3	24.3
	1999	29.0	29.0	29.0
	2000	27.8	27.8	27.8
HYPOLIMNION	1990	30.7	30.7	30.7
	1992	27.8	27.8	27.8
	1993	32.5	32.5	32.5
	1994	31.9	31.9	31.9
	1995	29.7	29.7	29.7
	1996	32.5	32.5	32.5
	1997	26.2	26.2	26.2
	1998	36.6	36.6	36.6
	1999	31.2	31.2	31.2
	2000	39.8	39.8	39.8
INLET BROOK	1990	23.0	23.0	23.0
	1992	24.9	24.9	24.9
	1993	29.6	29.6	29.6
	1994	27.6	27.6	27.6
	1995	26.9	26.9	26.9
	1996	27.4	27.4	27.4
	1998	23.1	23.1	23.1
	1999	28.1	28.1	28.1
	2000	26.9	26.9	26.9

Table 6.

**LONG POND
NORTHWOOD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
ISLAND POND BK				
	1996	24.2	24.2	24.2
METALIMNION				
	1990	24.5	24.5	24.5
	1992	24.1	24.1	24.1
	1993	25.4	25.4	25.4
	1994	27.6	27.6	27.6
	1995	26.8	26.8	26.8
	1996	30.3	30.3	30.3
	1997	25.9	25.9	25.9
	1998	29.6	29.6	29.6
	1999	29.2	29.2	29.2
	2000	28.0	28.0	28.0
NORTHWEST INLET B				
	1990	35.0	35.0	35.0
	1992	25.1	25.1	25.1
NORTHWEST INLET				
	1990	23.3	23.3	23.3
WEED BROOK				
	1990	25.8	25.8	25.8
	1993	30.6	30.6	30.6
	1994	26.9	26.9	26.9
	1995	28.0	28.0	28.0
	1996	30.6	30.6	30.6
	1999	27.5	27.5	27.5
	2000	27.9	27.9	27.9

Table 8.

**LONG POND
NORTHWOOD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
BEAVER BROOK OUTLET	1989	10	10	10
	1990	4	4	4
	1992	7	7	7
	1993	7	7	7
	1994	10	10	10
	1995	6	6	6
	1996	10	10	10
	1997	12	12	12
	1998	9	9	9
	1999	5	5	5
	2000	8	8	8
BUG BROOK OUTLET	1989	9	9	9
	1990	9	9	9
	1992	12	12	12
	1993	13	13	13
	1994	9	9	9
	1995	7	7	7
	1996	16	16	16
	1997	72	72	72
	1998	12	12	12
	1999	3	3	3
	2000	8	8	8
EPILIMNION	1989	15	15	15
	1990	14	14	14

Table 8.

**LONG POND
NORTHWOOD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
	1992	7	7	7
	1993	8	8	8
	1994	16	16	16
	1995	14	14	14
	1996	10	10	10
	1997	13	13	13
	1998	11	11	11
	1999	1	1	1
	2000	6	6	6
HYPOLIMNION	1989	11	11	11
	1990	38	38	38
	1992	16	16	16
	1993	18	18	18
	1994	21	21	21
	1995	11	11	11
	1996	12	12	12
	1997	15	15	15
	1998	20	20	20
	1999	11	11	11
	2000	27	27	27
INLET BROOK	1989	28	28	28
	1990	10	10	10
	1992	13	13	13
	1993	15	15	15
	1994	5	5	5

Table 8.

**LONG POND
NORTHWOOD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
	1995	22	22	22
	1996	54	54	54
	1998	75	75	75
	1999	14	14	14
	2000	19	19	19
ISLAND POND BK				
	1996	19	19	19
METALIMNION				
	1989	17	17	17
	1990	8	8	8
	1992	10	10	10
	1993	12	12	12
	1994	8	8	8
	1995	9	9	9
	1996	12	12	12
	1997	13	13	13
	1998	18	18	18
	1999	1	1	1
	2000	7	7	7
NORTHWEST INLET B				
	1990	13	13	13
	1992	17	17	17
NORTHWEST INLET				
	1989	13	13	13
	1990	8	8	8

Table 8.

**LONG POND
NORTHWOOD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
WEED BROOK	1990	57	57	57
	1993	62	62	62
	1994	64	64	64
	1995	84	84	84
	1999	11	11	11
	2000	17	17	17

Table 9.
LONG POND
NORTHWOOD

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
August 6, 2000			
1.0	22.3	6.1	70.0
2.0	22.0	6.0	69.0
3.0	19.7	5.8	62.0
4.0	16.4	4.5	45.0
5.0	11.9	0.7	6.0
6.0	9.6	0.9	8.0
7.0	8.7	1.0	8.0
8.0	8.0	2.3	19.0
9.0	7.5	1.8	15.0
10.0	7.0	0.0	0.0
11.0	6.9	0.0	0.0
12.0	6.6	0.0	0.0
13.0	8.0	0.1	1.0
14.0	8.9	0.2	2.0

Table 10.**LONG POND
NORTHWOOD****Historic Hypolimnetic dissolved oxygen and temperature data.**

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
September 2, 1990	14.0	5.0	2.3	18.0
July 26, 1992	14.0	6.0	0.2	1.6
July 25, 1993	14.0	4.0	0.5	4.0
July 31, 1994	14.0	3.7	0.7	5.0
August 6, 1996	14.0	5.2	0.5	4.0
August 22, 1997	14.0	4.8	0.7	5.0
August 23, 1998	14.0	5.5	0.2	1.0
August 10, 1999	14.0	6.4	0.1	1.0
August 6, 2000	14.0	8.9	0.2	2.0

Table 11.

**LONG POND
NORTHWOOD**

**Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
BEAVER BROOK OUTLET	1992	0.6	0.6	0.6
	1993	1.2	1.2	1.2
	1997	0.8	0.8	0.8
	1998	0.5	0.5	0.5
	1999	0.5	0.5	0.5
	2000	0.2	0.2	0.2
BUG BROOK OUTLET	1992	0.9	0.9	0.9
	1993	1.3	1.3	1.3
	1997	6.0	6.0	6.0
	1998	0.6	0.6	0.6
	1999	0.3	0.3	0.3
	2000	0.3	0.3	0.3
EPILIMNION	1992	0.9	0.9	0.9
	1993	0.8	0.8	0.8
	1997	0.3	0.3	0.3
	1998	0.8	0.8	0.8
	1999	0.4	0.4	0.4
	2000	0.3	0.3	0.3
HYPOLIMNION	1992	1.9	1.9	1.9
	1993	2.7	2.7	2.7
	1997	0.6	0.6	0.6
	1998	5.3	5.3	5.3
	1999	1.7	1.7	1.7
	2000	3.3	3.3	3.3

Table 11.**LONG POND
NORTHWOOD****Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
INLET BROOK	1992	1.3	1.3	1.3
	1993	1.1	1.1	1.1
	1998	3.3	3.3	3.3
	1999	0.6	0.6	0.6
	2000	0.6	0.6	0.6
METALIMNION	1992	1.0	1.0	1.0
	1993	1.1	1.1	1.1
	1997	0.6	0.6	0.6
	1998	1.5	1.5	1.5
	1999	0.4	0.4	0.4
	2000	0.4	0.4	0.4
NORTHWEST INLET B	1992	3.4	3.4	3.4
WEED BROOK	1993	25.0	25.0	25.0
	1999	0.8	0.8	0.8
	2000	1.2	1.2	1.2